

Harvey S. John

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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY,—NO. LXXIX.

(Continued from page 30.)

IV. THE AMERICAN REPRESENTATIVES OF *ASPLENIUM* *RUTA-MURARIA*

It has been repeatedly remarked by American students of ferns that, whereas *Asplenium Ruta-muraria* L. of Europe acquired its name from its common habitat, the plant of North America is rarely, if ever, found on brick- or stone-walls. European botanists are essentially unanimous as to the habitat of their plant. Thus, more than a century ago, the great student of the ferns, Schkuhr, stated it: "Hab. ad muros et in fissuris rupium";¹ and later authors give the following statements. Moore: "on rocks and on ruins, and in abundance on old walls";² Hooker: "Common on rocks and old walls and buildings";³ Lowe: "Delighting to grow on old walls, both brick and stone, and more especially on the northern side, and preferring to mount up the walls as high as possible";⁴ Britten: "The name is an apt one, . . . although not confined to walls, it is essentially a wall plant";⁵ Christ: "In bewohnten Europa ist die Art von dem anstehenden Fels und den grössern Blöcken auf die Mauern, sowohl die rohen Trockenmauern der Strassenborde und Kulturterrassen, als auf die ältern, mit Mörtel verbundenen Mauern gewandert, sodass wohl im ganzen solche künstliche Standorte vorwiegen; daher

¹ Schkuhr, Krypt. Gewächse, 75 (1809); rupium *misprinted* "pupium."

² Moore, Nat. Printed Brit. Fern. oct. ed. ii. 121 (1860).

³ Hooker, Brit. Ferns, t. 28 (1861).

⁴ Lowe, Our Native Ferns, ii. 222 (1867).

⁵ Britten, Eur. Ferns, 111 (1881).

der Name";¹ Druery: "common on old walls, bridges, etc. . . . almost invariably rooted in old mortar."² Contrasted with these typical statements of the European habitat we have in America, such statements as the following. Torrey: "Limestone rocks, usually in shady situations: rare";³ D. C. Eaton: "clefts of calcareous rocks . . . but not seen on walls in America";⁴ Clute: "It loves the sheltered nooks on dry cliffs";⁵ Waters: "It grows on sunny, exposed cliffs, or boulders";⁶ Slosson: "Seams, pockets, and ledges of calcareous rock: usually exposed to sun or in partial shade."⁷ From these characteristic statements it would appear that the plant of eastern America is a conservative and comparatively rare fern, that of Europe an aggressive and common type.

The ranges of the Eurasian and the American plants are also strikingly contrasted. *Asplenium Ruta-muraria*, according to the late James Britten, is "found in most parts of the United Kingdom [Great Britain and Ireland]"; thence "It extends throughout Europe, from Norway to Spain and Portugal, Italy, the Mediterranean Islands, Greece, and Turkey. It is found both in North and South Africa, and in many parts of Asia, from the Ural Mountains to Thibet and Kashmir,"⁸ etc. Christensen, however, cuts out the South African occurrence and says merely: "Europa. Asia septentr.—Himalaya. U. S. A. orient."⁹ but he has subsequently cited it from southwestern China near the Thibetan border.¹⁰ Ledebour¹¹ does not cite it from east of Lake Baikal and it is apparently not found in extreme eastern Asia.¹² The American plant occurs from Vermont to southern Ontario, south to Alabama and Arkansas; *i. e.* it has an Alleghenian range.

Long experience has shown that the Alleghenian flora is to a great extent made up of ancient species, with their nearest affinities in Japan or adjacent continental eastern Asia, rather than in western

¹ Christ, *Die Varietäten und Verwandten des Asplenium Ruta muraria L.*, Hedwigia, xlii. 155 (1903).

² Druery, Brit. Ferns, 76 (1910).

³ Torr. Fl. N. Y. ii. 492 (1843).

⁴ D. C. Eaton, Ferns N. A. i. 108 (1879).

⁵ Clute, Our Ferns in their Haunts, 162 (1901).

⁶ Waters, Ferns, 157 (1903).

⁷ Slosson, How Ferns Grow, 28 (1906).

⁸ Britten, l. c. 112 (1881).

⁹ C. Christens. Ind. Fil. fasc. iii. 130 (1905).

¹⁰ C. Christens. Acta Hort. Gothob. i. 80 (1924).

¹¹ Ledebour, Fl. Ross. iv. 520 (1852-3).

¹² It has been recorded as very rare in Japan, but neither Christ nor Christensen admit it from there.

Eurasia. Consequently, it would be most unusual for a rare or conservative plant, which in America is unknown north of Vermont and southern Ontario, to be common in Europe but rare or quite unknown in eastern Asia. Furthermore, it is quite contrary to our ordinary experience, that a local and non-aggressive Alleghenian species should in Europe be a common plant, there taking possession of the artificial walls built by man: roadside- and garden-walls, the mortar of brick or stone buildings, bridges, and even church-steeple. There are plenty (more than a thousand) of cases of youthful and aggressive European plants introduced into temperate eastern America and quickly overrunning the region; but, with the exception of the calcicolous aquatic, *Elodea canadensis*, conservative plants of temperate eastern America have rarely, if ever, shown pioneering tendencies in Europe.

From these considerations it would be surprising if the common European *Asplenium Ruta-muraria* and the rare fern of Alleghenian America are really identical. Nevertheless, I can find little indication in literature that they have even been suspected of being different. Most students of the ferns, Hooker, Moore, Mettenius, Luerssen, Milde, D. C. Eaton, Underwood, Slosson, Christensen and many others, seem to have regarded them as strictly identical; and some have even made positive assertions of the identity. Thus, Torrey, in 1843, said of the American fern: "In all respects similar to the European plant, except that it is usually smaller";¹ and Christ,² making a detailed study of the variations of the species, recognized no less than 17 varieties and subvarieties in Europe and identified with 4 of these European varieties the plants of eastern America. Very rarely a mild suggestion of a difference has been voiced. Thus, Michaux made the "*Obs. Europaeo multo minus*";³ Pursh, similarly said: "The American plant is very small, scarcely ever exceeding an inch or two in height";⁴ and Torrey's comment to the same effect has just been quoted. But since Torrey, apparently no one has commented even on the difference of size.

When the two series are carefully measured, however, the accuracy of the observations of Michaux, Pursh and Torrey becomes quite evident. I have studied 154 plants of the European series, with an

¹ Torr. l. c. 492 (1843).

² Christ, l. c. (1903).

³ Michx. Fl. Bor.-Am. ii, 266 (1803).

⁴ Pursh, Fl. Am. Sept. ii, 667 (1814).

average of 10 or 12 fronds each, and 290 plants of the American series, with an average of 6 or 8 fronds each. Measurements of stipe and frond and count of segments give the following results: the stipes of the European plant range from 1.8–15 cm. long, with an average length of 7 cm., of the American series 1–7.5 cm. with an average length of 4.5 cm.; the fronds of the European plant range from 1.5–7.5 cm. in length, with an average of 4 cm., those of the American plant from 1–6.5, with an average of 3.3. cm.; the largest fronds of each collection show in the European 7–60 segments (average 33) in the American 3–42 (av. 15). The difference of size noted by Michaux, Pursh and Torrey is, thus, very real.

But the differences are not limited to size. In European *Asplenium Ruta-muraria* the teeth of the segments are commonly bordered by a whitish cartilaginous rim which is frequently prolonged into a minute tip, and the mature sori become so confluent that their boundaries are quite obscured. In the American plant the teeth of the segments are coarser than is usual in the European and the cartilaginous border is only slightly, if at all, developed; and the mature sori are rarely completely confluent.

In the European plant the chaffy tips of the rhizomes and the chaffy bases of the stipes project above the root-bearing region of the short and thick rhizome and are easily seen under a low-power lens; in the American the tips of the rhizome and the chaffy stipe-bases are hidden among the rootlets of the elongate rhizome and can be seen only by dissecting away rootlets and marcescent old stipe-bases. This really important difference of the rhizomes has been beautifully shown, but apparently quite unappreciated, in some of the best illustrations. It is well displayed in such European illustrations as those of Schkuhr,¹ Lowe,² Britten³ and Druery⁴ and in the American plates of John Robinson,⁵ Williamson,⁶ D. C. Eaton⁷ and Tilton.⁸

When the basal chaff is examined it will be found that the scales of the European *Asplenium Ruta-muraria* are 3–6 mm. long, made up of a lattice-like frame with whitish lumina, the broadest part of the scale with usually 6–9 rows of cells, the cell-walls much thinner than

¹ Schkuhr, l. c. t. 80b (1809).

² Lowe, *Our Native Ferns*, ii. t. xlvi. (1869).

³ Britten, l. c. figs. on pp. 111 (copied from Gerarde's Herbal) and 112 (1881).

⁴ Druery, *Brit. Ferns and Vars.* t. v. (1910).

⁵ J. Robinson, *Ferns in their Homes and Ours*, t. xvi. (1878).

⁶ Williamson, *Ferns of Ky.* t. xix. (1878); *Fern Etchings*, t. xxiv. (1879).

⁷ D. C. Eaton, l. c. t. xv. fig. 1 (1879).

⁸ Tilton, *Fern Lover's Comp.* 89 (1922).

the broad lumina; while the basal scales of the American plants are shorter and firmer, 1.5–4 mm. long, with fewer rows of cells, the cell-walls as thick as the lumina. In the European plant the stipe usually bears slender curving trichomes or linear-filiform scales 1–3 mm. long; in the American series the stipe is quite naked or only rarely with a few short trichomes.

The indusia of the two plants are so similar as to present no quickly recognized differences, but, as already noted, the sori of the American are rarely as confluent as in the European. The spores are of practically the same size; but, whereas those of the European plant are marked with coarse irregular ridges, the spores of the American have a much finer sculpturing.

From this analysis it is apparent that Eurasian *Asplenium Ruta-muraria* is in its behavior and its technical details quite different from the Alleghenian plant which for a century and a quarter has been confused with it. It is, therefore, proper to separate the Alleghenian species as

ASPENIUM cryptolepis, n. sp., ab *A. Ruta-muraria* recedit rhizomate elongato apicibus radiculis basibusque stipitium marcescentibus vestito; stipitibus 1–6.5 (medio 4.5) cm. longis ad basin squamis setiformibus paucis instructis supra plerumque esquamosis; squamis basilaribus firmis lanceolatis 1.5–4 mm. longis loco latissimo cellulis 3–6-seriatis, parietibus cellularum crassis diametro luminum subaequantibus; lamina deltoidea vel deltoideo-ovata 1–6.5 (medio 3.3) cm. longa subcoriacea; segmentis 3–42 (medio 15) cuneato-rhombeis grosse dentatis, dentibus deltoideis vel oblongis obtusis vel subacutis margine plerumque vix hyalino; soris distinctis vel subconfluentibus; sporis minute rugulosis.—*A. Ruta-muraria* of Am. authors, not L.—Calcareous cliffs and ledges, rare and local, Vermont to southern Ontario, south to Alabama and Arkansas. The following, selected from many specimens, are typical. VERMONT: North Willoughby Cliff, July 14, 1887, *Faxon*; dry limestone ledge, Milton, August 6, 1924, *C. H. Knowlton*; Winooski Gorge, Colchester, *Blake*, no. 2153; Sharpshin Point, Burlington, October 3, 1857, *Wm. Boott*; Burlington Bay, July 7, 1909, *Kirk*; High Bridge, Winooski, August 7, 1877 and June 14, 1881, *Faxon*; Shelburne Bay, September 29, 1855, *Wm. Boott*; Mt. Philo, Charlotte, September 9, 1881, *Faxon*; Snake Mt., Addison, June 31, 1896, *Eggleston*; Pittsford, *Slosson*; Clarendon Gorge, August 27, 1897, *G. H. Ross*; rocks, Dorset, 1915, *E. H. Terry*; Mt. Aeolus, East Dorset, August 29, 1897, *Eggleston*; limestone ledges in hillside pasture, East Dorset, July 24, 1907, *G. G. Kennedy*; Manchester, *M. A. Day*, no. 253; cliffs, North Pownal, July 25, 1898, *Eggleston*; August 1, 1898, *Churchill*; crevices of ledges, usually in half-shade, The Cliff, North Pownal, June 22, 1901, *F. G.*

Floyd; with *Camptosorus*, Gregor Rocks, North Pownal, August 12, 1902, *Blanchard*. MASSACHUSETTS: Mt. Toby, Sunderland, August 10, 1871, *L. B. Tuckerman*, and later collections by *Bishop*, *Jesup et al*; rocky hill, Stockbridge, June 27, 1900, *Ralph Hoffmann*; shaded limestone ledges, Sheffield, July 6, 1906, *Bissell* (TYPE in Gray Herb.); lime ledge, Sheffield, June 1, and September 30, 1919, *Churchill*. CONNECTICUT: lime ledges, Canaan, August 14, 1912 and October 28, 1916, *F. G. Floyd*; shaded limestone ledges, Salisbury, September 22, 1903, *Bissell*; ledges, Miles Mt., Salisbury, October 19, 1916, *F. G. Floyd*; calcareous rocks by Housatonic River, Kent, *Austin & Eames*, no. 4059; Bull's Falls, above Gaylordsville, July 28, 1889, *I. Holden*; dry calcareous rocks, Gaylordsville, *Austin & Eames*, no. 8308; moist shaded limestone ledge by Housatonic River, New Milford, *A. E. Blewitt*, no. 1205; dry limestone on shaded bank of Housatonic, New Milford, *Austin & Eames*, no. 8308. NEW YORK: Poughkeepsie, *Van Gieson*; Little Falls, *Vasey*; Jamesville, July, 1885, *Hulst*. NEW JERSEY: vicinity of Newton, *Dowell*, no. 4816; limestone rocks, Sussex Co., 1867, *Austin*. PENNSYLVANIA: Wilkesbarre, 1867, *H. Coultas*; Easton, *Traill Green*; Bushkill Creek, Northampton Co., *L. M. Stevens*; along Mill Creek, near Lancaster, July 15, 1890, *Small*; limestone cliffs, Centre Co., *Tuttle & Rothrock*. VIRGINIA: at 365-460 m. (1200-1500 ft.), Mt. Crawford, Rockingham Co., *Heller*, no. 785; Natural Bridge, May 30, 1891, *Churchill*, and at later dates by *Kennedy*, *T. O. Fuller et al*; Wythe Co., June 7, 1872, *A. H. Curtiss*. WEST VIRGINIA: Harper's Ferry, *B. D. Greene*; shaded limestone bluff by Shenandoah R., Jefferson Co., September 9, 1899, *Wm. Palmer*. NORTH CAROLINA: on ledges at 1220 m. (4000 ft.), Pilot Mt., July 4, 1915, *P. O. Schallert*. ONTARIO: north end of Manitoulin Island, Georgian Bay, *Scott* in herb. Geol. Surv. Can. no. 66,415. MICHIGAN: without locality, *State Collection*. INDIANA: limestone, Jefferson Co., 1872, *J. Hussey*. TENNESSEE: on rocks along Tennessee R., Knoxville, *Ruth*, no. 556; Holston River, below Concord, July, 1872, *W. Faxon*; Post Oak Springs, Roane Co., *Pollard & Maxon*, no. 412. MISSOURI: calcareous rocks, near Lott's Mills, Perry Co., November 15, 1886, *C. H. Demetrio*; wet mossy rocks, Shannon Co., *Bush*, no. 436; on boulders in woods, Montier, *Bush*, no. 2795; shaded limestone rocks, near Montier, *E. J. Palmer*, no. 19,343.

ILLUSTRATIONS (as *A. Ruta-muraria*): *J. Robinson*, Ferns in their Homes and Ours, t. xvi. (1878); *Williamson*, Ferns of Ky. t. xix. (1878) and Fern Etchings, t. xxiv. (1879); *D. C. Eaton*, Ferns N. A. i. t. xv. fig. 1 (1879); *Tilton*, Fern Lover's Comp. 89 (1922).

European *Asplenium Ruta-muraria* is so variable that many varieties have been proposed, *Milde* recognizing 10, *Christ* 17. *A. cryptolepis*, on the other hand, is a tolerably constant plant. The fronds of young or small individuals have fewer and more dilated segments than in the older or larger plants but such variation is found in the

individual colonies and is of no taxonomic importance. In one area, however, the limestone cliffs of Clifton Gorge, of the Little Miami River in Greene County, Ohio, the plant has so far departed from typical *A. cryptolepis* that it may well be designated as a geographic variety. The six different collections before me are constant in having lanceolate segments with long-attenuate tips and incised margins. This extreme may be called

A. CRYPTOLEPIS, var. *ohionis*, n. var., segmentis lanceolatis incis apice longe attenuatis.—OHIO: Springfield, *T. G. Lea*; Clifton, Greene County, 1873, *J. Y. Bergen, Jr.*; limestone rocks, Yellow Springs, Greene Co., August 3, 1902, June 15, 1905, *L. S. Hopkins* (TYPE in Gray Herb.); on Niagara limestone, Clifton Gorge, Little Miami River, August 22, 1920, *Clara G. Mark*.

Of this Ohio variety, Mr. L. S. Hopkins wrote, in 1907:

"The single station known for it is in Greene County, and at the present time numbers approximately one hundred plants whose short stiff rootstocks find solid footing in the cracks and crevices of a western exposure of Niagara Limestone. No other fern with which I am acquainted is so exacting in its choice of a home. This station has been under my observation for several years, and quite a number of plants have been collected from it. Just around a corner and not over five feet from the place where strong, vigorous plants grow, not a single plant has been found on a southern exposure of the same material and ecological conditions."—*L. S. Hopkins, Fern. Bull. xv. 6 (1907).*

That the plants of var. *ohionis* have been more numerous is indicated by the collections of Lea and of Bergen (two different collections) and by the fact that material of it has been widely distributed to different herbaria. Such a specimen, collected at Clifton in 1877 by G. E. J. Spencer, was the basis of the erroneous identification by Christ¹ of the Ohio plant with the European *A. Ruta-muraria*, var. *lanceolum* Christ—the European plant, as shown in Christ's plate, having the numerous (42–54) segments of *A. Ruta-muraria*, with their teeth few and small or obsolete, *A. cryptolepis*, var. *ohionis* having the few (5–28) segments and other characters of *A. cryptolepis*, but with elongate tips and incised margins.

¹ Christ, *Hedwigia*, xlii. 171 (1903).

V. THE EASTERN AMERICAN OCCURRENCE OF
ATHYRIUM ALPESTRE

(Plates 161-168)

IN 1917 Dr. F. K. Butters pointed out¹ that the plants which had long passed in America as *Athyrium alpestre* (Hoppe) Rylands or as *Phegopteris alpestris* (Hoppe) Mett. differ from the Eurasian type and he called our plant *A. alpestre*, var. *americanum*; and a year later Maxon, emphasizing, besides the characters noted by Butters, some habital points of the plant of western North America, elevated it to specific rank as *A. americanum* (Butters) Maxon² and designated as the type (which Butters had neglected to do) a plant from the Selkirk Mountains. Still later, Christensen, who certainly knows the Eurasian plant, after discussing the Eurasian range of *A. alpestre* said: "In America the closely allied form *A. alpestre americanum* Butters."³ The treatments recently published give us, then, the choice of calling the American plant either *A. alpestre*, an endemic American variety, an endemic American species or a "closely allied form," and it is with the hope of throwing some clearing light upon the dilemma that the present notes and the accompanying photographs are presented.

In eastern America *Athyrium alpestre* or its representatives are as yet known from only two regions: the gulches of Bard Harbor Hill, one of the Highlands of St. John, in northwestern Newfoundland, and the northern and northeastern slopes of the Table-top Range in Gaspé County, Quebec. On my four different visits to these areas I have during the first days studied the plants with enthusiasm and have put up, altogether, hundreds of sheets of specimens; but in each case, the plants soon proving to be abundant, my enthusiasm for them has gradually waned. The plant of Gaspé had been included by Butters and by Maxon with the cordilleran var. *americanum* or *A. americanum*; consequently, when the Newfoundland material was labeled it was assumed to be the same and it was later recorded⁴ without question as var. *americanum*. Comparison now shows, however, that the Newfoundland and Gaspé plants are not quite identical, nor are either of them satisfactorily placed with the cordilleran plant. The plant of Eurasia has decidedly "leafy" fronds,

¹ Butters, RHODORA, xix. 204 (1917).

² Maxon, Am. Fern. Journ. viii. 120 (1918).

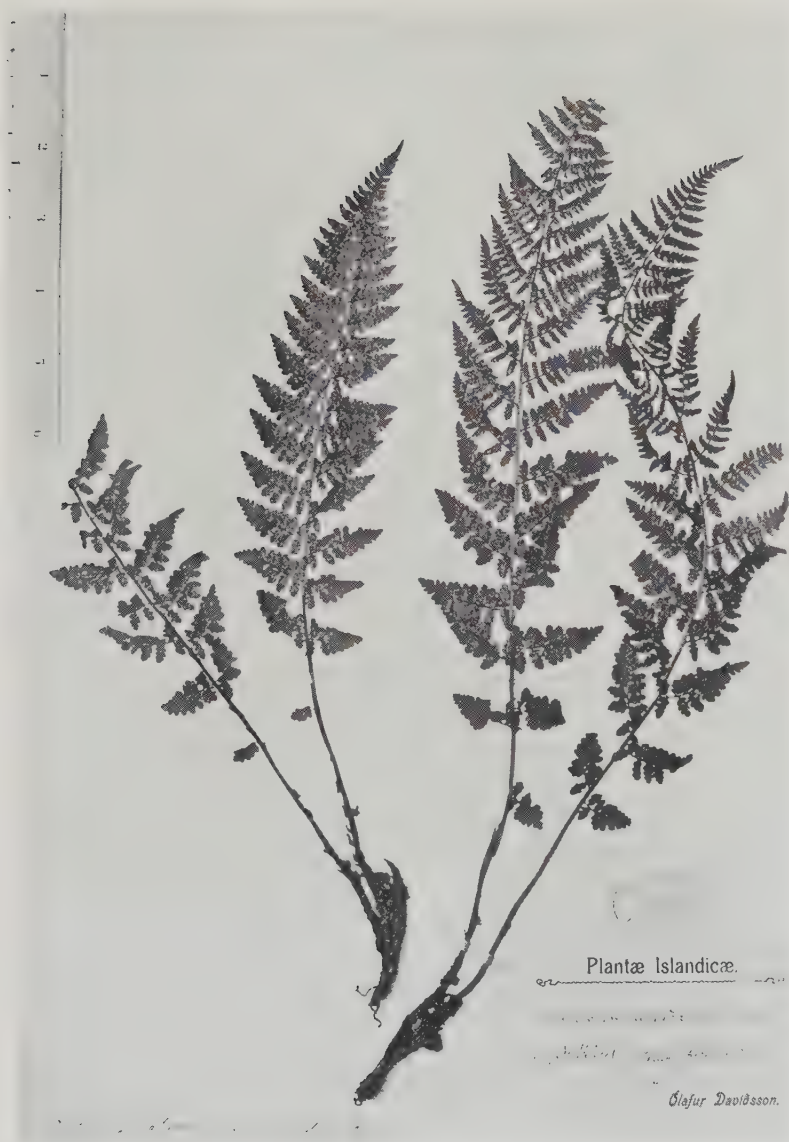
³ C. Christens. in Hultén, Fl. Kamtch. and Adj. Isl. i. 40 (1927).

⁴ Fernald, RHODORA, xxviii. 117, 148 (1926).



— AND LAYTON —

ATHYRIUM ALPESTRE FROM SWITZERLAND, $\times \frac{1}{3}$



ATHYRIUM ALPESTRE FROM ICELAND, $\times \frac{1}{3}$



PLANTS OF THE PACIFIC COAST

Athyrium alpestre

ATHYRIUM ALPESTRE, VAR. AMERICANUM FROM CALIFORNIA, $\times \frac{1}{3}$



Athyrium alpestre Nutt.
var. *americanum* Nutt.

Bozai Flora of the Sierra Nevada
CALIFORNIA

No. 810

Polygala ...

East slope Uncomp. Mts.

above Tenolomv. Meadows

Abund. 10100. *Tenolomv.*

Like near Arctic-Alpine

ATHYRIUM ALPESTRE, VAR. AMERICANUM FROM CALIFORNIA, $\times \frac{1}{3}$



ATHYRIUM ALPESTRE FROM NEWFOUNDLAND, $\times \frac{1}{3}$



ATHYRIUM ALPESTRE FROM NEWFOUNDLAND, $\times \frac{1}{3}$



SELKIRK FLORA
 Charles H. Newcomb, Selkirk, N. B.
 British Columbia, Canada, N. B.

Athyrium alpestre (L.) Hook. & Grev.

1 cm

August 1881

TYPE OF *ATHYRIUM ALPESTRE*, VAR. *AMERICANUM*, $\times \frac{1}{3}$



TYPE OF *ATHYRIUM ALPESTRE*, VAR. *GASPENSE*, $\times \frac{1}{3}$

ordinarily elliptic-lanceolate to ovate-lanceolate (pl. 161), one-fourth to one-half as broad as long, but in extreme specimens from open habitats (pl. 162) they are narrowly elliptic-oblong. Their larger pinnae are spreading or obliquely ascending, from oblong-lanceolate to narrowly deltoid and pinnatifid into broad-based oblong ultimate lobes; the sori are median and when well developed 0.75–1.4 mm. across and seemingly without any indusium. According to Butters, "Careful dissection shows, however, that the receptacle of the sorus is slightly elongated along the vein, and under a compound microscope it is almost always possible to find a vestigial indusium in the same position that the indusium holds in forms of *A. Filix-femina* with round sori. This indusium . . . often consists merely of two or three hairs joined together side by side at the base."

Athyrium alpestre, var. *americanum* Butters was described as having the segments of the fronds narrower and more distant than in the European plant, the ultimate ones linear; sori only 0.5–0.7 mm. across, submarginal and partly covered by the reflexed marginal teeth; vestigial indusium wanting. Butters added that, "As certain intermediate forms occur, it is the opinion of the author that this plant should be considered a distinct geographical variety rather than a species." Maxon, on the other hand, subsequently said "An examination of the very ample material in the National Herbarium, however, including some of the numbers cited by Butters as intermediate in leaf cutting, reveals no specimens which are truly intermediate in this or other respects . . . The American material is essentially uniform in all respects save size, and since it differs constantly from the European plant it should rank as a distinct species, ***Athyrium americanum***. The invariable absence of reduced indusia, which might be regarded as an inconsequential point if the plants were otherwise like the European, is a substantiating character of some worth; but disregarding this feature, the plant is different enough in gross characters to warrant separation. The conspicuously narrow, oblique, widely separated segments give it a strict, singularly skeleton-like aspect widely different from that of the leafy European plant, which has the segments spreading and more broadly attached; and the oblique, elongate-deltoid pinnae (with the basal pinnules often greatly produced) are equally at variance from the spreading, oblong-acuminate pinnae of the European species." Another character of the plant of northwestern North America not emphasized by Butters

nor by Maxon is the almost consistently linear-oblong to lance-oblong outline of the frond which certainly averages much narrower in proportion to its length than does the European frond. Reduced specimens of the European plant (pl. 162) have fronds very similar in outline to some of var. *americanum* (pl. 163) but well-developed European plants (pl. 161), have an elliptic- to ovate-lanceolate outline.

If the extreme plant of western North America (pl. 164) were alone to be considered, *Athyrium americanum* would upon some characters stand well apart; but when we take into account the Gaspé material, which both Butters and Maxon identify with *A. americanum*, and the Newfoundland material, the specific separation of the American from the European plant becomes more difficult. Such typical Newfoundland specimens as shown in pl. 165 and 166 (a small plant and a large frond from the same station) have essentially the outline, pinnae and degree of dissection of the two extremes of the European plant shown (pl. 161 and 162) and they also have the sori large and submedian as in the European plant. It does not seem possible, then, to separate them specifically or even varietally from the European material. It should be noted, furthermore, that their pinnae and those of the two European specimens illustrated are a bit more oblique than and quite as "elongate-deltoid" as in the type of *A. americanum* (pl. 167) specially selected by Maxon. Incidentally, one of the stated characters of *A. americanum* was that each sorus is "protected by a reflexed tooth of the pinnule." This character (which seems to be more ecological than morphological) is obvious in most American specimens but in some extra-American material (for instance Davidsson's Iceland plant, pl. 162) the teeth are even more vigorously reflexed than in the type of *A. americanum*; and many continental European specimens show some reflexing of the teeth. As a differential character it has no value.

The Gaspé plant (pl. 168) differs at once from the European and Newfoundland material seen in its tripinnate or, in large plants, almost quadripinnate fronds, with the ultimate strongly toothed segments linear or linear-lanceolate and remote; and its submarginal sori are only 0.3-0.8 mm. across. Its fronds have the elliptic-lanceolate to ovate-lanceolate outline of the European and Newfoundland plant, rather than the linear-oblong to narrowly lance-oblong outline of *A. americanum*. The Gaspé plant is, therefore,

intermediate between that of Europe and Newfoundland and that of the cordilleran region; the European and Newfoundland plant at one extreme, the cordilleran at the other extreme of a series.¹

Of the characters which have been ascribed to *Athyrium americanum* as distinctive the reputedly more oblique and elongate-deltoid pinnæ are no more oblique nor deltoid in the type of *A. americanum* than in some characteristic specimens of the European plant, while the recurving of the marginal teeth is more conspicuous in some European specimens than in many of the American. The characteristically narrow outline of *A. americanum* appears in several sheets of European material, while the Gaspé plant, which both Butters and Maxon have considered identical with the cordilleran, has, when well developed, as broad an outline as the most extreme European plant. There remain to distinguish the continental American plants the narrower and more distant segments with smaller and mostly submarginal sori and the absence of the minute vestigial indusium which is often found, after sufficient search, in the European. But some specimens of the European plant before me have sori as small as in the American, the Gaspé plant has fronds as broad as in the broadest European, and at one of its stations (Southwest Gulch, Fernald, Wiegand, Long, Gilbert & Hotchkiss, no. 27,245) the fronds of the Newfoundland plant are unusually divided and thus make a strong approach to those of the Gaspé plant. In view of these facts I am forced to the conclusion, originally reached by Butters and recently subscribed to by Christensen, that *A. alpestre*, var. *americanum* is a geographic variety rather than a species; but that the plant of Gaspé is not var. *americanum*, but is a second variety standing morphologically as well as geographically midway between typical *A. alpestre* and its var. *americanum*.

These conclusions may be summarized in the following brief synopsis.

¹ This geographic phenomenon, the Newfoundland variant of a circumpolar series being nearer to the European than to the plant of continental eastern America, is frequent and I have specially noted it in the case of *Cypripedium parviflorum*, var. *planipetalum* Fern. RHODORA, xxviii, 168 (1926) and *Habenaria viridis*, var. *interjecta* Fern. l. c. 173 (1926). The *Cypripedium* of northern and western Newfoundland is so similar to the Eurasian species that, at the time of describing the Newfoundland plant, I suggested that *C. Calceolus* of Eurasia and *C. parviflorum* of continental North America might be extremes of one circumpolar type, with the Newfoundland plant bridging the morphological gap which separates them. Similarly, the northern Newfoundland (and northwest American) variety of *Habenaria viridis* is exactly intermediate between typical *H. viridis* of Europe and its var. *bracteata* of eastern North America. It is interesting, therefore, to add *Athyrium alpestre* to the species showing this European and Newfoundland relationship.

Fronds bipinnate or somewhat tripinnatifid, elliptic-lanceolate to ovate-lanceolate (rarely lance-oblong), mostly one-fourth to one-half as broad as long; pinnules oblong-lanceolate, with the broad-based oblong ultimate lobes mostly approximate: sori median or submedian, the larger ones 0.75 to 1.4 mm. across..... *A. alpestre*, var. *typicum*.

Fronds tripinnatifid, tripinnate or nearly quadripinnate; ultimate segments of the pinnules linear or linear-lanceolate and distant: sori chiefly submarginal, mostly 0.3-0.8 mm. across.

Fronds elliptic-lanceolate to ovate-lanceolate, from three-tenths to nearly one-half as broad as long, tripinnate to nearly quadripinnate..... Var. *gaspensis*.

Fronds linear-oblong to narrowly lance-oblong, from one-tenth to one-fourth as broad as long, tripinnatifid to tripinnate..... Var. *americanum*.

ATHYRIUM ALPESTRE (Hoppe) Rylands, var. **typicum**. *Aspidium alpestre* Hoppe, *Neue Taschenbuch*, 216 (1805). *Pseudathyrium aspestre* (Hoppe) Newm. *Phytologist*, iv. 370 (1851). *Phegopteris alpestris* (Hoppe) Mett. *Fil. Hort. Lips.* 83 (1856). *Athyr. alpestre* (Hoppe) Rylands in Moore, *Ferns Gr. Brit. and Irel. Nat. Print. fol. ed. t. 7* (1857).—Eurasia and northwestern Newfoundland. The following are from NEWFOUNDLAND: wet quartzite rocks and seepy banks along upper Deer Pond Brook, Highlands of St. John, July 28, 1925, *Fernald & Long*, no. 27,242; quartzite escarpment one-half mile south of Deer Pond, August 20, 1925, *Wiegand, Gilbert & Hotchkiss*, nos. 27,212, 27,243—see pl. 165 and 166; turfy and mossy quartzite rocks along Man's Humbug Brook, Highlands of St. John, August 21, 1925, *Fernald & Long*, no. 27,244; wet quartzite rocks and gravel along brook, Southwest Gulch, northeast of summit of Bard Harbor Hill, August 22, 1925, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 27,245; these stations all at altitudes from 260-460 m. (850-1500 ft.), the specimens all distributed as var. *americanum* and so recorded by Fernald, *RHODORA*, xxviii. 117, 148 (1926).

Superficially *Athyrium alpestre*, var. *typicum* so strongly resembles *A. Filix-femina* (Willd.) Presl as readily to be mistaken for it; in fact, the two were both included by Linnaeus in his *Polypodium rhauticum*. It is at once distinguished by its almost complete lack of an indusium (sometimes represented by a minute vestige), on which account the plant has found a place in *Polypodium* and *Phegopteris* and as a distinct genus, *Pseudathyrium*. Its fronds are firmer than in *A. Filix-femina*, almost coriaceous, and its spores are blackish and reticulated. Fronds of the European plant are shown in pl. 161 and 162, of the Newfoundland plant in pl. 165 and 166, the photographs most kindly made by Professor J. F. Collins.

Var. **gaspense**, n. var., frondibus elliptico-lanceolatis vel ovato-lanceolatis 2-7 dm. longis 0.7-2.5 dm. latis tripinnatis vel subquadri-

OK from Fernald 31: 165, 1429.

pinnatis, segmentis ultimis linearibus vel lineari-lanceolatis plerumque distantibus; soris 0.3–0.8 mm. diametro submarginalibus.—North-eastern region of the Table-top Range, Gaspé County, QUEBEC: crevices of granitic rock, altitude 750–1050 m., easterly and northerly slopes of Table-top Mountain, August 9, 1906, *Fernald & Collins*, no. 151 (small plants of exposed situation); forming extensive areas in alluvium of alpine brooks, easterly and northerly slopes of Table-top Mountain, August 9, 1906, *Fernald & Collins*, no. 151a (large plants up to 9 dm. high)—nos. 151 and 151a distributed as *Phegopteris alpestris* and cited by Butters as *A. alpestre*, var. *americanum*; alpine and subalpine meadows and brooksides at about 1100 m. alt., north-eastern slope of Mt. Dunraven, August 2, 1923, *Fernald, Dodge & Smith*, no. 25,384 (TYPE in Gray Herb.); brooksides and meadows at about 975 m. alt., above the cascades, head of Gorge of Northeast Branch of Rivière Ste. Anne des Monts, August 5, 1923, *Fernald, Dodge & Smith*, no. 25,385; subalpine meadows on eastern base (alt. about 900 m.) of Mt. Au Clair, August 10, 1923, *Fernald & Smith*, no. 25,386; nos. 25,384–25,386 distributed as var. *americanum*.

The type-specimen, photographed by Professor Collins, is illustrated in pl. 168.

Var. AMERICANUM Butters, RHODORA, xix. 204 (1917), excluding plant of Quebec. *A. americanum* (Butters) Maxon, Am. Fern. Journ. viii. 120 (1918), where a type-specimen is designated (*Heacock*, no. 554).—Alaska to Colorado, Nevada and California.

The type-specimen is illustrated in pl. 167; other specimens in pl. 163 and 164.

EXPLANATION OF PLATES 161 TO 168

(Photographs by J. F. Collins)

161, *ATHYRIUM ALPESTRE* from Switzerland; 162, from Iceland. 163, *A. ALPESTRE*, var. *AMERICANUM* from Tulare Co., California, *Culbertson*, no. 9538; 164, from Tuolumne Meadows, California, *Smiley*, no. 810. 165 and 166, *A. ALPESTRE* from Newfoundland, *Wiegand, Gilbert & Hotchkiss*, no. 27,243. 167, TYPE of *A. ALPESTRE*, var. *AMERICANUM*, from Selkirk Mts., British Columbia, *Heacock*, no. 554. 168, TYPE of *A. ALPESTRE*, var. *GASPENSE*, from Gaspé Co., Quebec, *Fernald, Dodge & Smith*, no. 25,384.

(To be continued.)

THE GRASS GENUS DIGITARIA

KENNETH K. MACKENZIE

IN the June 1927 number of RHODORA Dr. A. S. Hitchcock has an article concerning "The Validity of the Grass Genus Digitaria." This genus originated with Heister, and was successively taken up by various authors, namely by Fabricius in 1759, Adanson in 1763,

Haller in 1768 and Scopoli in 1772. Each and every one of these authors attributed the genus to Heister. In going into this matter Prof. Hitchcock kindly gave full information concerning what these other authors stated concerning this genus, but he entirely ignored Heister, the universally recognized author of the genus.

Following a procedure common in those days of few botanical works the authors who cited Heister did not give a definite reference. This fortunately was supplied by Ludwig (Def. Gen. Pl. 417. 1760), who gave the reference "Dactylis Roy. 56. Linn. Ed. V. n. 80. Digitalia Heist. Syst. 12. Fabric. p. 207." Heister's *Systema plantarum generale*, published in 1748, is a rare work, and neither the New York Botanical Garden nor my own library possessed it. However, Dr. B. D. Jackson kindly sent me the necessary extract from the copy of the work which once belonged to Linnaeus in the library of the Linnean Society of London. This reads as follows:

"Plantae monocotyledones apetalae sive gramineae

Ordo I Monoclinae

* * * *

3. Digitatae

Digitalia, H. (= Heister)

Dactylis Royeni

Mannaria (pro gramine mannae)"¹

In other words it was evident that *Digitalia* Heist. was merely a change in name for *Dactylis* Royen. Consulting Royen (*Fl. Leyd. Prodr.* 56-7. 1740) one finds that he devoted over a page to a full treatment of his genus *Dactylis*.² After a long description he gave four species, as follows:

1. *Dactylis spicis numerosis alternis patentibus, calycibus unifloris.*

Gramen dactylon majus, panicula longa, spicis plurimis nudis crassis. Sloan. flor. 34. hist. 1. p. 112. t. 69. f. 1.

2. *Dactylis spicis saepius quaternis alternis patulis, calycibus unifloris.*

Gramen paniceum minus, spica divulsa, insulae barbadensis. Pluk. alm. 174. t. 189. f. 5.

¹ The *Gramen Manna* of Matthioli (1583 ed. p. 348; Camerarius *Epitome* p. 742, 1586) was *Syntherisma sanguinale* (Haller *Hist. Stirp. Helv.* 2: 244, 1768). Although there is doubt whether this was the correct use of this name (Haller l. c. 244, 220), it is probable that this was the plant to which Heister referred when he used the name *Mannaria* "pro gramine mannae."

² It may be here remarked that, while Linnaeus took up Royen's genus *Dactylis*, yet he radically changed his generic description, and gave entirely different species than those given by Royen. In other words *Dactylis* L. is really an entirely different thing than *Dactylis* Royen (Linnaeus *Gen. Pl.* (Ed. 5) 80. 1754; *Sp. Pl.* 71. 1753).

3. *Dactylis spicis binis terminatricibus linearibus, calycibus unifloris.*
4. *Dactylis spicis numerosis alternis culmo appressis, longitudine internodiorum, calycibus bifloris.*

Gramen palustre, locustis erucaciformibus. Bar. rar. 105. t. 2.

No. 1 is *Paspalum virgatum* L. (Hitchcock RHODORA 29: 114; Linnaeus Sp. Pl. Ed. 2, 81. 1762). This Sloane species was at first erroneously referred by Linnaeus to his *Panicum dissectum* (Sp. Pl. 57. 1753).

No. 2 is referred to *Panicum colonum* L. (Syst. Ed. 10, 870. 1759) by Linnaeus (Sp. Pl. Ed. 2, 84. 1762). This is now known as *Echinochloa colona* (L.) Link.

No. 3 I have not identified.

No. 4 is cited under *Phalaris erucaciformis* L. (Sp. Pl. 55. 1753) by Linnaeus. This is now known as *Beckmannia erucaciformis* (L.) Host.

It will be seen from the above that Fabricius, the first author after Linnaeus to take up the name used it with absolute correctness, (except possibly the reference to Ray) when he wrote "*Digitaria* Heist. *Dactylis* Rai. Gramen dactylon majus panicula longa, spicis pluribus nudis crassis. Sloane." He took the first species given by Royen and specifically cited it, and he specifically cited Heister the author of the genus, who in turn had specifically cited Royen. The remaining species of Royen he did not cite, but it is to be noted that none of them belong to the genus to which Prof. Hitchcock wishes to apply the name *Digitaria*.

Following Fabricius, the name *Digitaria* as used by Adanson (Fam. Pl. 2: 38, 550. 1763) represents the genus of Heister and Fabricius plus three references, all of which represent *Tripsacum dactyloides* L. (Sp. Pl. 972. 1753).

Haller's use of the name (Hist. Stirp. Helv. 2: 244. 1768) represents the genus of Heister and Fabricius as added to by Adanson, plus *Syntherisma sanguinale* (L.) Dulac and *Capriola Dactylon* (L.) Kuntze. And Scopoli's use of the name (Fl. Carn. Ed. 2, 1: 52. 1772) represents the genus of Heister and Fabricius, as added to by Adanson and Haller.

Prof. Hitchcock says "Since Adanson does not propose a new genus but credits the name to Heister his use of *Digitaria* should be regarded as a misapplication, not the publication of a new genus." This is

quite correct, but Scopoli did exactly the same thing, and yet our Washington agrostologist insists that Scopoli's publication must be treated as a publication. I must confess that I cannot follow such logic.

Under all codes of nomenclature the name *Digitaria* is a synonym of *Paspalum* L. and it is typified by *Paspalum virgatum* L.

MAPLEWOOD, NEW JERSEY.

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